Chapter 4: Profile of Manufacturers

Introduction

Based on the *1982 Census of Manufactures* and information from effluent guideline development materials, EPA identified four industrial categories other than SIC Major Group 49 that are most likely to be affected by the §316(b) regulation. These industries, referred to collectively here as "manufacturers," were selected because of their known use of cooling water. They are Paper and Allied Products (SIC 26), Chemicals and Allied Products (SIC 28), Petroleum and Coal Products (SIC 29), and Primary Metal Industries (SIC 33).

While facilities in other industrial groups also use cooling water and may therefore be subject to §316(b) regulations, their total cooling water intake flow is believed to be small relative to that of the four selected industries. Therefore, this Profile of Manufacturers focuses on the manufacturing groups listed above.

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The remainder of this chapter is divided into five sections:[1]

- 4A: Paper and Allied Products (SIC 26)
- 4B: Chemicals and Allied Products (SIC 28)
- 4C: Petroleum and Coal Products (SIC 29)
- 4D: Steel (SIC 331)
- 4E: Aluminum (SIC 333/335)

Each industry section is further divided into the following four subsections: (1) domestic production, (2) structure and competitiveness, (3) financial condition and performance, and (4) §316(b) facilities. Each sector profile only presents data for SIC codes that were identified in the §316(b) Industry Screener Questionnaire as important users of cooling water directly withdrawn from a water of the United States.[2]

[1] Steel and aluminum are the two dominant products in the U.S. industrial metals industry. These two markets, however, are structured differently and are therefore discussed in two separate profile sections.

[2] The electronic version of this report is comprised of six separate files, one for each of the five industries and one for the glossary of terms.

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4A Paper and Allied Products (SIC 26)

EPA's *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures* identified five 4-digit SIC codes in the Paper and Allied Products industry (SIC 26) with at least one existing facility that operates a CWIS, holds a NPDES permit, and withdraws more than two million gallons per day (MGD) from a water of the United States, and uses at least 25 percent of its intake flow for cooling purposes (facilities with these characteristics are hereafter referred to as "§316(b) facilities"). For each of the five SIC codes, Table 4A-1 below provides a description of the industry sector, a list of primary products manufactured, the total number of screener respondents, and the number and percent of §316(b) facilities.

Table 4A-1: §316(b) Facilities in the Paper and Allied Products Industry (SIC 26)

SIC	SIC Description	Important Products Manufactured	Number of Screener Respondents		
			Total	§316(b) Facilities	
				No.†	%
2611	Pulp Mills	Pulp from wood or from other materials, such as rags, linters, wastepaper, and straw; integrated logging and pulp mill operations if primarily shipping pulp.	66	43	65.8%
2621	Paper Mills	Paper from wood pulp and other fiber pulp, converted paper products; integrated operations of producing pulp and manufacturing paper if primarily shipping paper or paper products.	286	128	44.5%
2631	Paperboard Mills	Paperboard, including paperboard coated on the paperboard machine, from wood pulp and other fiber pulp; and converted paperboard products; integrated operations of producing pulp and manufacturing paperboard if primarily shipping paperboard or paperboard products.	187	45	23.9%
Total			***539***	***216***	***40.0%***
Other Paper and Allied Products Sectors					
2676	Sanitary Paper Products	Sanitary paper products from purchased paper, such as facial tissues and handkerchiefs, table napkins, toilet paper, towels, disposable diapers, and sanitary napkins and tampons.	4	4	100.0%
Total Paper and Allied Products (SIC 26)					
Total 26			**543**	**219**	**40.4%**

† Information on the percentage of intake flow used for cooling purposes was not available for all screener respondents. Facilities for which this information was not available were assumed to use at least 25% of their intake flow for cooling water purposes The reported numbers of §316(b) facilities may therefore be overstated.

Source: *EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999; Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual 1987.*

The responses to the Screener Questionnaire indicate that three main sectors account for the largest numbers of §316(b) facilities in the Paper and Allied Products industry: (1) Pulp Mills (SIC 2611), (2) Paper Mills (SIC 2621), and (3) Paperboard Mills (SIC 2631). Fifty-eight percent of the 219 §316(b) facilities in the Paper and Allied Products industry are paper mills. Paperboard mills and pulp mills account for 21 and 20 percent of facilities, respectively. The

remainder of the Paper and Allied Products profile therefore focuses on these three industries.

4A.1 Domestic Production

The Paper and Allied Products industry is one of the top ten U.S. manufacturing industries. It also ranks in the top five sectors in sales of nondurable goods. Growth in the paper industry is closely tied to overall gross domestic product (GDP) growth because nearly all of the industry's products are consumer oriented. Over the past decade, however, exports have taken on an increasingly important role, and growth in a number of key foreign paper and paperboard markets is expected to play an important role in the health and expansion of the U.S. Paper and Allied Products industry in the future (McGraw-Hill, 1999).

The industry is one of the primary users of energy, second only to the chemicals and metals industries. However, 56 percent of total energy used in 1996 to 1997 was self-generated, second only to the chemicals industry (McGraw-Hill, 1999).

a. Output

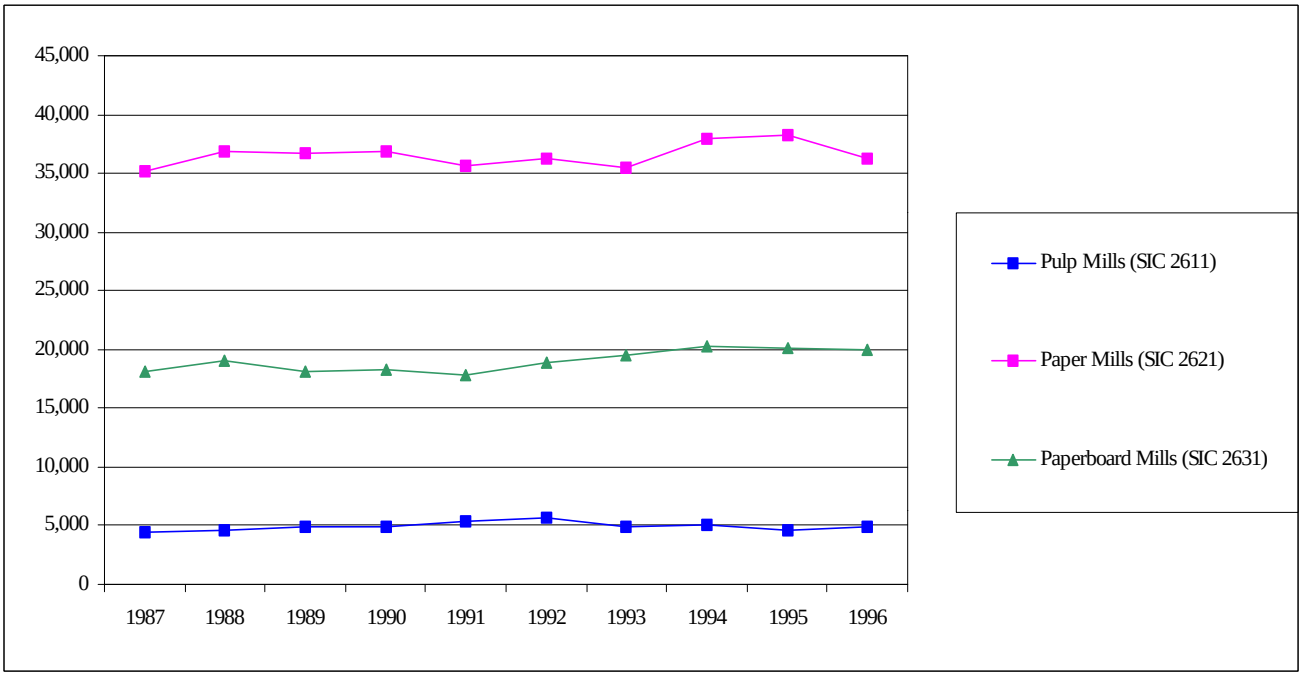
The U.S. Paper and Allied Products industry experienced record sales in 1995. The value of shipments for pulp, paper, and paperboard mills totaled $4.7, $38.2, and $20.2 billion, respectively. In 1996, lower domestic and foreign demand, declining prices, and inventory drawdowns led to a decline in the industry's total shipments by 2.2 percent in real terms (MCGraw-Hill, 1998). More recently, however, consecutive years of increasing demand, slowly increasing prices, higher capacity utilization rates, and inventory drawdowns have led to better industry performance.

Figure 4A-1 shows the trend in ***value of shipments*** and ***value added*** for the three profiled sectors between 1987 and 1996.[3] Value of shipments and value added are two of the most common measures of manufacturing output. They provide insight into the overall economic health and outlook for an industry. Value of shipments is the sum of the receipts a manufacturer earns from the sale of its outputs. It is an indicator of the overall size of a market or the size of a firm in relation to its market or competitors. Value added is used to measure the value of production activity in a particular industry. It is the difference between the value of shipments and the value of inputs used to make the products sold.

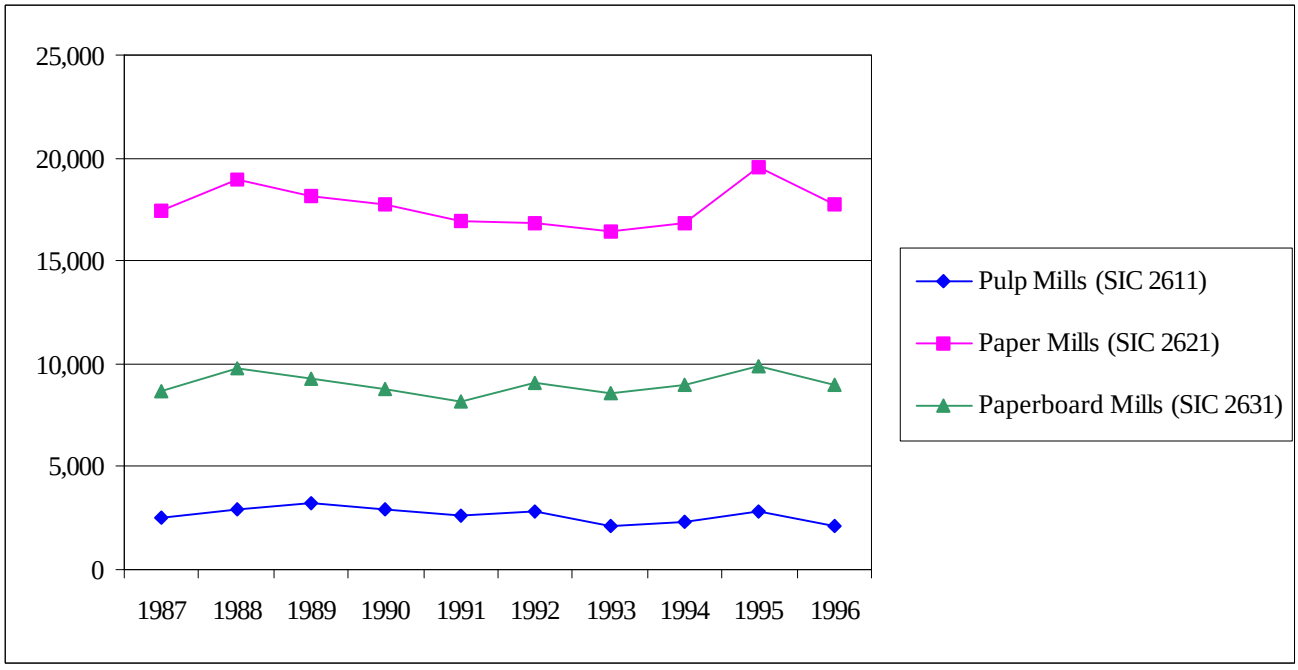
[3] Terms highlighted in bold and italic font are further explained in the glossary.

Figure 4A-1: Value of Shipments and Value Added for Profiled Paper and Allied Products Sectors ($1999 millions)

Value of Shipments ($1999 millions)



Value Added ($1999 millions)



Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

b. Prices

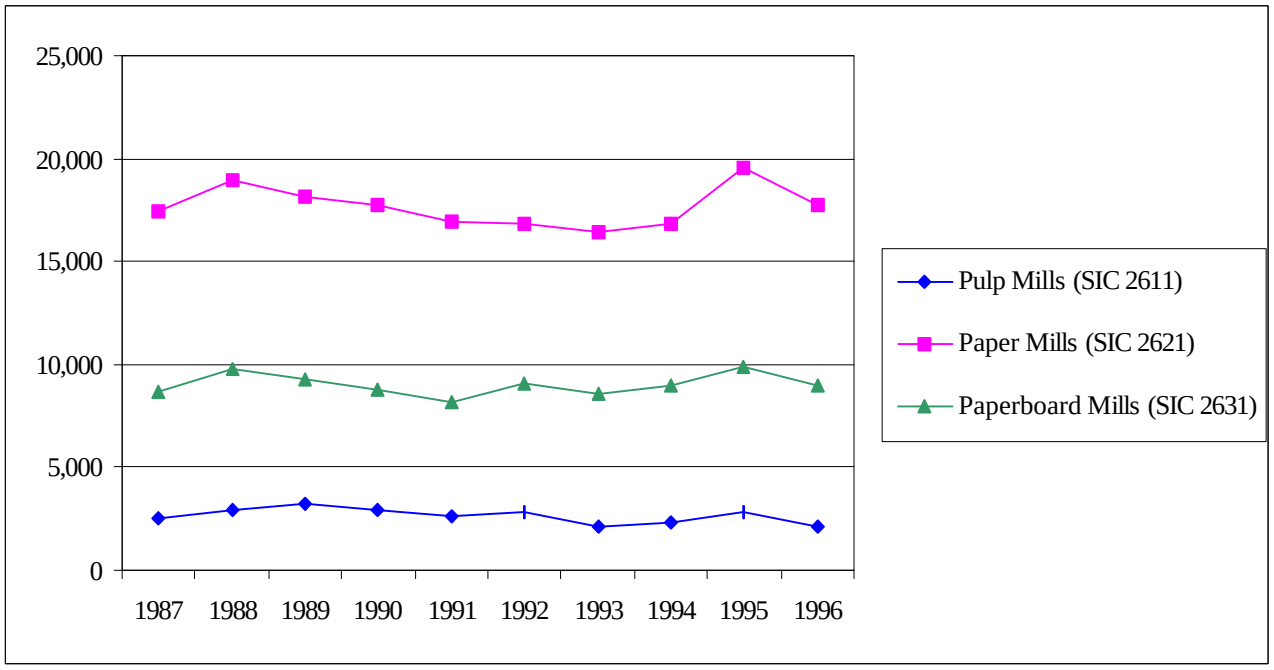
Most products of the Paper and Allied Products industry are commodities. Within these almost purely competitive markets, prices are established by supply and demand. Price levels in the U.S. paper industry are therefore closely tied to domestic and foreign demand as well as industry capacity and operating rates, which determine supply (S&P, 1999).

The paper industry suffered from low prices throughout the early 1990s. These price depressions were the result of the paper boom of the late 1980s which prompted the industry to make heavy investments in capacity expansions. However, lengthy construction periods mean that the new capacity often becomes operational when industry conditions begin to slow. When production of a given paper grade increases just as demand slows, the excess supply gives rise to dramatic price declines. The capacity expansions in the 1980s and weakening demand in the early 1990s thus resulted in overcapacity and a period of supply/demand imbalance which led to low prices and weak operating conditions in the industry (S&P, 1999).

More recently, the industry has grown in a much more disciplined manner: capacity increases in the paper and paperboard sector were limited to 1.9 percent and 1.2 percent in 1997 and 1998, respectively, compared to an average growth rate of 2.5 percent over the 10 preceding years. This is partly the result of firms seeking expansion through the acquisition of existing mills rather than the construction of new facilities, increasing a firm's capacity but not of the industry overall. Prices have started to recover as a result of the reduction in inventories and the better balance between supply and demand. However, the Asian financial crisis, which began in 1997, and the ensuing decrease in demand from affected Asian markets, have somewhat slowed this recovery (S&P, 1999).

Figure 4A-2 shows the ***producer price index*** (PPI) at the 4-digit SIC code for the profiled pulp, paper, and paperboard sectors. The PPI is a family of indexes that measure price changes from the perspective of the seller. This profile uses the PPI to inflate nominal monetary values to constant dollars.

Figure 4A-2: Producer Price Indexes for Profiled Paper and Allied Products Sectors



Source: Bureau of Labor Statistics, Producer Price Index.

c. Number of Facilities and Firms

The Statistics of U.S. Businesses reports that the number of facilities and firms in the Pulp Mills sector has increased by almost 35 percent between 1990 and 1996. One of the reasons for this growth has been the dramatic increase in the number of mills that produce deinked recycled market pulp. These are secondary fiber processing plants that utilize recovered paper and paperboard as their sole source of raw material. Producers of deinked market pulp have experienced strong demand over the past several years in both U.S. and foreign markets. As a result, the U.S. deinked recycled market pulp capacity more than doubled between 1994 and 1998 (McGrraw-Hill, 1998).

Growth in the number of facilities and firms in the other Paper and Allied Products sectors has been considerably slower. These sectors have been characterized by overcapacity in the 1990s which has limited the rate of construction of new facilities. More recently, there have been shutdowns in all three profiled Paper and Allied Products sectors. In 1998 and 1999, 577,000 and 2.5 million tons of paper and paperboard capacity were removed from the capacity base. Over the same period, more than one million tons of pulp capacity were removed (Pponline, 1999).

Tables 4A-2 and 4A-3 present the number of facilities and firms for the three profiled Paper and Allied Products sectors between 1989 and 1996.

Table 4A-2: Number of Facilities for Profiled Paper and Allied Products Sectors

Year	Pulp Mills (SIC 2611)		Paper Mills (SIC 2621)		Paperboard Mills (SIC 2631)	
	Number of Facilities	Percent Change	Number of Facilities	Percent Change	Number of Facilities	Percent Change
1989	46	n/a	322	n/a	221	n/a
1990	46	0%	327	2%	226	2%
1991	53	15%	349	7%	228	1%
1992	44	-17%	324	-7%	222	-3%
1993	46	5%	306	-6%	217	-2%
1994	52	13%	316	3%	218	0%
1995	53	2%	317	0%	219	0%
1996	62	17%	344	9%	228	4%
Percent Change 1989-1996		34.8%		6.8%		3.2%

Source: Small Business Administration, Statistics of U.S. Businesses.

Table 4A-3: Number of Firms for Profiled Paper and Allied Products Sectors

Year	Pulp Mills (SIC 2611)		Paper Mills (SIC 2621)		Paperboard Mills (SIC 2631)	
	Number of Firms	Percent Change	Number of Firms	Percent Change	Number of Firms	Percent Change
1990	31	n/a	158	n/a	102	n/a
1991	37	19%	186	18%	102	0%
1992	29	-22%	161	-13%	95	-7%
1993	32	10%	153	-5%	99	4%
1994	37	16%	163	7%	96	-3%
1995	32	-14%	163	0%	93	-3%
1996	43	34%	186	14%	101	9%
Percent Change 1990-1996		38.7%		17.7%		-1.0%

Source: Small Business Administration, Statistics of U.S. Businesses.

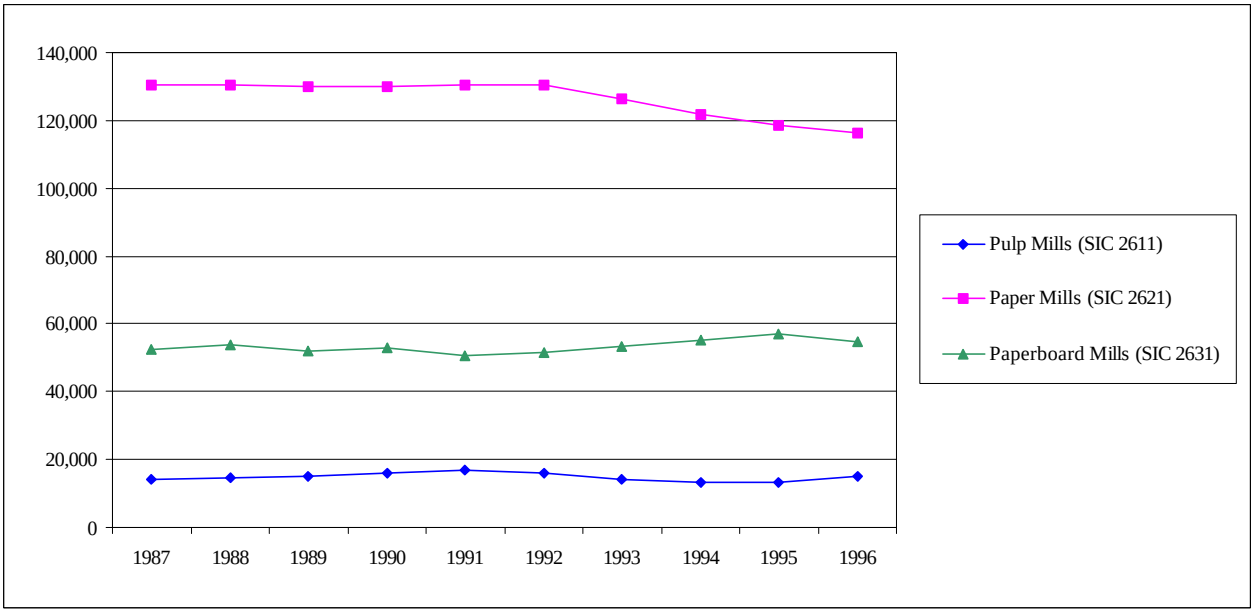
d. Employment and Productivity

The U.S. Paper and Allied Products industry is among the most modern in the world. It has a highly skilled labor force and is characterized by large capital expenditures which are largely aimed at production improvements.

Employment in the three profiled paper industry sectors has remained relatively constant between 1987 and 1992. However, between 1992 and 1996, employment has steadily decreased in the Paper Mills sector. This trend may partly be the result of the continuing globalization process where producers haven striven to implement technological improvements covering distribution, handling, processing, converting, and environmental protection.

Figure 4A-3 below presents employment levels for the three profiled Paper and Allied Products sectors between 1987 and 1996.

Figure 4A-3: Employment for Profiled Paper and Allied Products Sectors



Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

Table 4A-4 presents the change in value added per labor hour, a measure of ***labor productivity***, for each of the profiled industry sectors between 1987 and 1996. The table shows that labor productivity in the Pulp Mills sector has been relatively volatile, posting several double-digit gains and losses between 1987 and 1996. These changes have been primarily driven by fluctuations in value added.

Overall, the sector's productivity decreased by 17 percent during this period. The Paper Mills and Paperboard Mills sectors have remained more stable and have experienced overall labor productivity changes of 10 percent and -3 percent, respectively.

Table 4A-4: Productivity Trends for Profiled Paper and Allied Products Sectors, Millions of $1999

Year	Pulp Mills (SIC 2611)				Paper Mills (SIC 2621)				Paperboard Mills (SIC 2631)			
	Value Added	Prod. Hours (mill.)	Value Added/Hour		Value Added	Prod. Hours (mill.)	Value Added/Hour		Value Added	Prod. Hours (mill.)	Value Added/Hour	
			No.	Percent Change			No.	Percent Change			No.	Percent Change
1987	2,554	24	107	n/a	17,479	213	82	n/a	8,668	89	98	n/a
1988	2,881	24	121	13%	18,958	215	88	7%	9,808	91	108	10%
1989	3,199	25	126	4%	18,193	214	85	-4%	9,286	89	104	-4%
1990	2,910	28	105	-17%	17,739	211	84	-1%	8,802	91	97	-7%
1991	2,631	28	95	-9%	16,955	212	80	-5%	8,160	87	94	-3%
1992	2,824	26	107	13%	16,795	215	78	-2%	9,092	88	103	9%
1993	2,119	23	92	-15%	16,414	212	77	-1%	8,609	90	96	-7%
1994	2,354	22	108	18%	16,789	206	82	6%	8,999	94	96	0%
1995	2,813	23	124	15%	19,523	201	97	19%	9,853	98	101	5%
1996	2,128	24	89	-28%	17,733	197	90	-7%	8,995	95	95	-6%
Percent Change 1987-1996			-17%				10%				-3%	

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

e. Capital Expenditures

The Paper and Allied Products industry is a highly capital intensive industry. Capital-intensive industries are characterized by large manufacturing facilities which reflect the economies of scale required to manufacture products efficiently. ***New capital expenditures*** are needed to extensively modernize, expand, and replace existing capacity to meet growing demand. Consistent high levels of capital expenditures have made the Paper and Allied Products industry one of the most modern industries in the world (Stanley, 2000). The total level of capital expenditures for the pulp, paper, and paperboard industries was $5.8 billion in 1996 (in constant $1999). The Paper Mills and Paperboard Mills sectors accounted for approximately 89 percent of that spending (see Table 4A-5). Most of the spending is for production improvements (through existing machine upgrades, retrofits, or new installed equipment), environmental concerns, and increased recycling (McGraw Hill, 1999).

New capital expenditures for both the Pulp Mills and Paperboard Mills sectors have dramatically increased during the time period of 1987 to 1996, rising 161 and 127 percent, respectively. Most of the investment occurred in the late 1980s, followed by declines in the early 1990s. The capital investments made in the late 1980s was for capacity expansion in response to the paper boom (S&P, 1999). Since 1992, capital spending has leveled off in all three profiled industries. This trend was reversed in 1996, when industry spending returned to the level of the early 1990s as a result of revived orders due to increased global economic activity and dwindling customer inventories (S&P, 1999).

A fair amount of the industry's new capital expenditures has been spent on environmental equipment. The Department of Commerce estimates that environmental spending has accounted for about 14 percent of all capital outlays made by the Paper and Allied Products industry in 1996 (S&P, 1999).

Table 4A-5: Capital Expenditures for Profiled Paper and Allied Products Sectors ($1999 millions)

Year	Pulp Mills (SIC 2611)		Paper Mills (SIC 2621)		Paperboard Mills (SIC 2631)	
	Capital Expenditures ($1999 millions)	Percent Change	Capital Expenditures ($1999 millions)	Percent Change	Capital Expenditures ($1999 millions)	Percent Change
1987	242	n/a	3,346	n/a	1,022	n/a
1988	268	10.4%	3,618	8.1%	1,790	75.1%
1989	530	98.0%	5,435	50.2%	1,842	2.9%
1990	841	58.6%	4,459	-17.9%	3,405	84.8%
1991	998	18.8%	3,879	-13.0%	2,555	-25.0%
1992	800	-19.9%	3,213	-17.2%	2,390	-6.4%
1993	494	-38.2%	3,160	-1.6%	1,984	-17.0%
1994	332	-32.8%	3,491	10.5%	1,911	-3.7%
1995	311	-6.4%	2,327	-33.3%	1,719	-10.0%
1996	632	103.4%	2,884	23.9%	2,321	35.0%
Percent Change 1987- 1996		161%		-14%		127%

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

f. Capacity Utilization

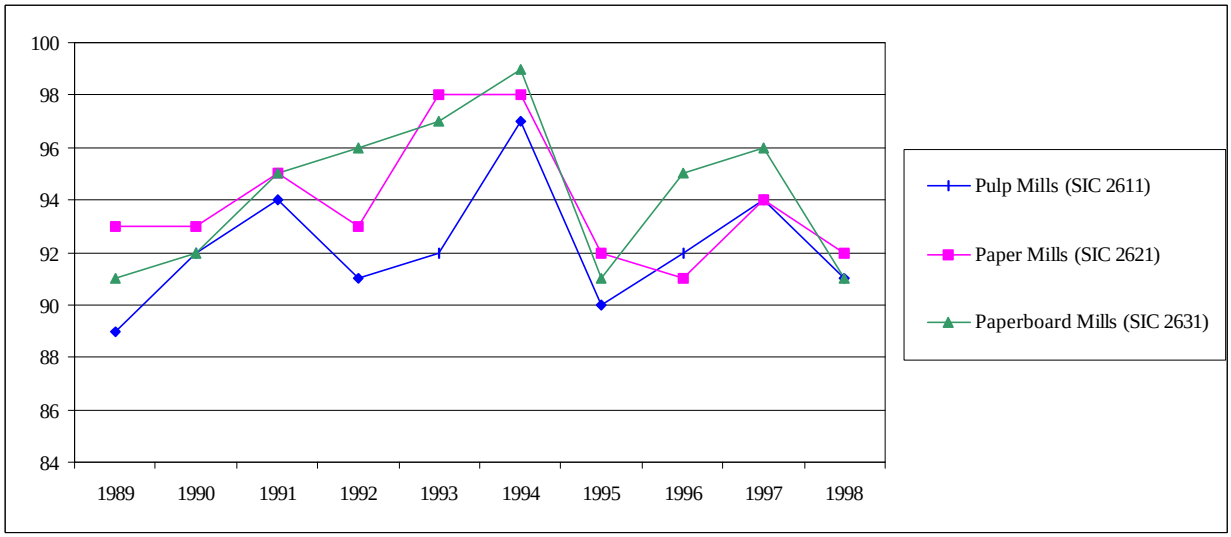
Capacity utilization measures actual output as a percentage of total potential output given the available capacity. Capacity utilization is an index used to identify potential excess or insufficient capacity in an industry and can help project whether new investment is likely.

The capacity utilization trends for all three profiled industries are consistent with the trends in investments, supply, and demand discussed earlier. Capacity utilization rates increased between 1989 and 1994, and then plummeted in 1995. This sharp drop was the result of the inventory drawdown cycle which had begun in 1995 in response to low demand and oversupply (McGraw-Hill, 1999). As inventories were sold off and global economic activity started to pick up, capacity utilization rates began to increase again in 1996 (S&P, 1999).

According to the U.S. Industry and Trade Outlook, a utilization rate in the range of 92 to 96 percent is necessary for the Pulp Mills sector to remain productive and profitable (McGraw-Hill, 1999).

Figure 4A-4 presents the capacity utilization indexes from 1989 to 1998 for the three profiled sectors.

Figure 4A-4: Capacity Utilization Indexes for Profiled Paper and Allied Products Sectors



Source: Department of Commerce, Bureau of the Census, Current Industrial Reports, Survey of Plant Capacity.

4A.2 Structure and Competitiveness of the Paper and Allied Products Industry

Paper and Allied Products companies range in size from giant corporations having billions of dollars of sales, to small producers with revenue bases a fraction of the size. Because all Paper and Allied Products companies use the same base materials in their production, most manufacture more than one product (S&P, 1999).

Most products offered by the Paper and Allied Products makers are commodities. Within these almost purely competitive markets, prices are established by the intersection of supply and demand. To escape the extreme price volatility of commodity markets, many smaller manufacturers have differentiated their products by offering value-added grades. The smaller markets for value-added products make this avenue less available to the larger firms (S&P, 1999).

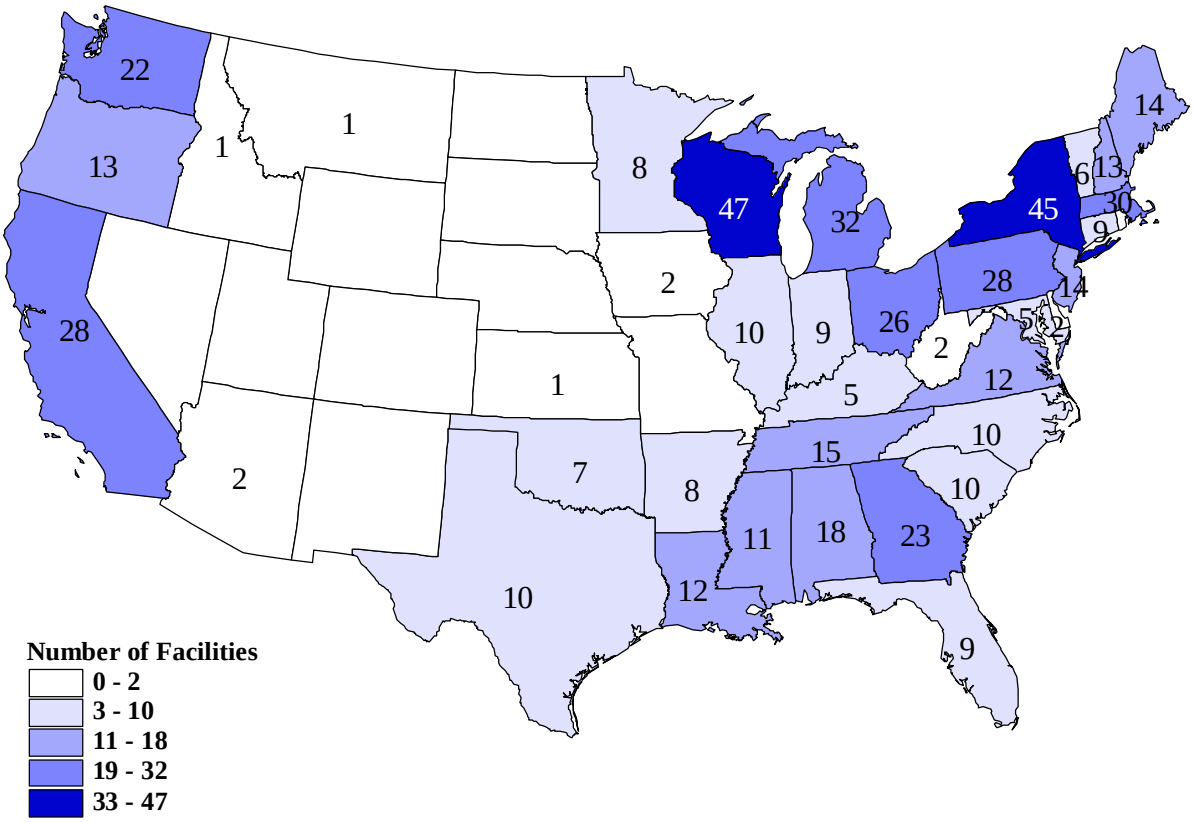
The paper industry has also begun to focus on consolidation. In recent years, most companies with a desire for greater operating capacity have looked to mergers rather than building new pulp or paper mills (S&P, 1999). New capacity additions in 1999 in the Paper and Allied Products industry were at their lowest level in the past ten years and the trend in the future seems to remain the same (Pponline.com, 2000).

a. Geographic Distribution

The geographic distribution of pulp, paper, and paperboard mills varies with the different types of mills. Traditional pulp mills tend to be located in regions where pulp trees are harvested from natural stands or tree farms. The Southeast (GA, AL, NC, TN, FL, MS, KY), Northwest (WA, CA, AK), Northeast (ME) and Northern Central (WI, MI) regions account for the major concentrations of pulp mills. Deinked market pulp plants, on the other hand, are typically located close to a large metropolitan area, which can consistently provide large amounts of recovered paper and paperboard (McGrraw-Hill, 1998).

Paper mills are more widely distributed, located in proximity to pulping operations and/or near converting sector markets. Since the primary market for paperboard products is manufacturing, the distribution of paperboard mills is similar to that of the manufacturing industry in general.

Figure 4A-5: Number of Facilities in Profiled Paper and Allied Products Sectors by State



Source: Department of Commerce, Bureau of the Census, Census of Manufacturers, 1992.

b. Facility Size

Most of the facilities in the three profiled industry sectors fall in the middle employment size categories, with either 100 to 249, or 250 to 499 employees. However, the larger facilities (those with 500 or more employees) account for the majority of the industries' value of shipments.

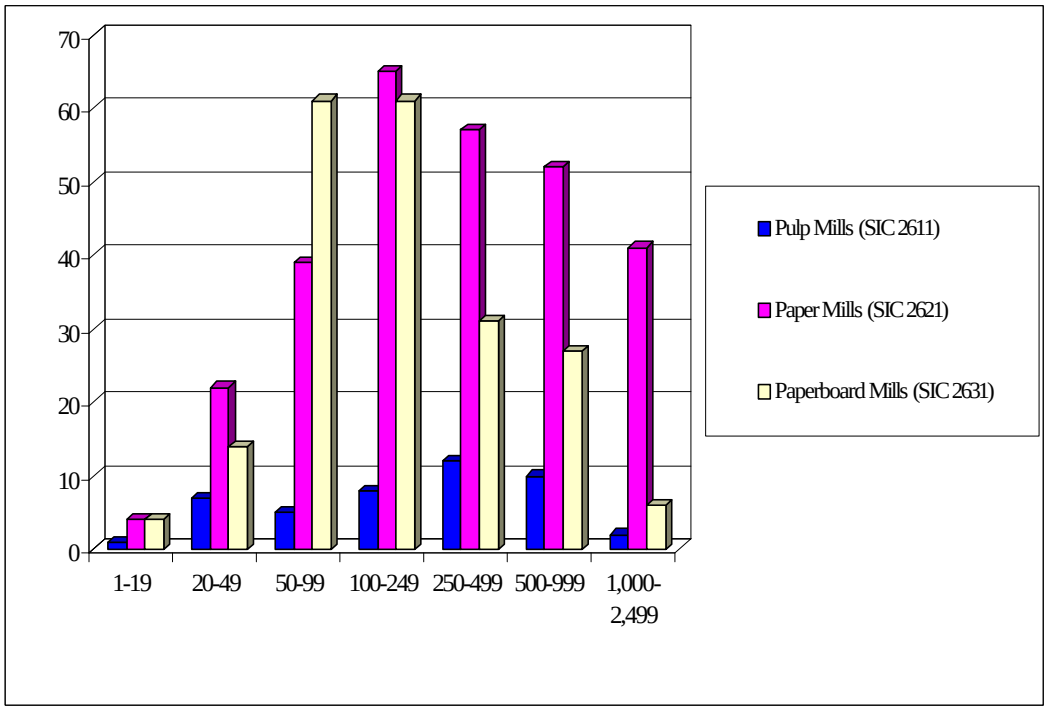
The number of pulp mills is noticeably smaller than that of paper and paperboard mills, and pulp mills have considerably lower value of shipments. The size distribution of all three profiled sectors, however, is very similar.

- Seventy-one percent of all *Pulp Mills* employ 100 employees or more. These facilities account for approximately 97 percent of the sector's value of shipments.
- Thirty-three percent of all *Paper Mills* have more than 500 employees. They account for 71 percent of the sector's value of shipments.
- Sixteen percent of all *Paperboard Mills* employ 500 people or more. These facilities account for 56 percent of the sector's value of shipments.

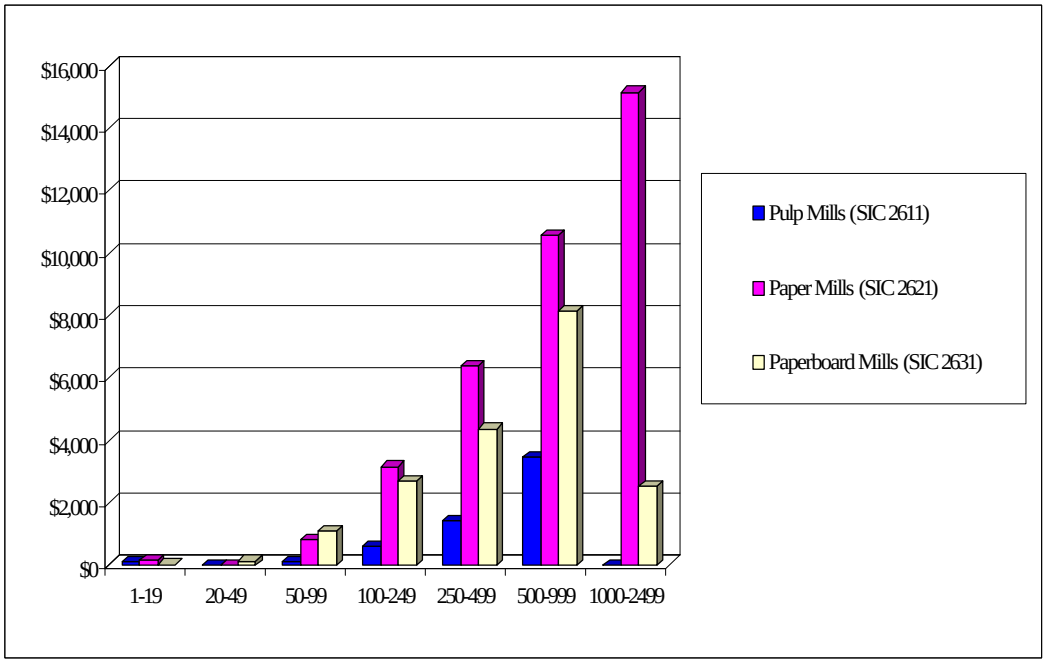
The distribution of the number of facilities and the industries' value of shipment are presented in Figure 4A-6 below.

Figure 4A-6: Number of Facilities and Value of Shipments by Employment Size Category for Profiled Paper and Allied Products Sectors

Number of Facilities (1992)



1992 Value of Shipments (millions of $1999)



Source: Department of Commerce, Bureau of the Census, Census of Manufactures, 1992.

c. Firm Size

The Small Business Administration (SBA) defines small firms in the Paper and Allied Products industries according to the firm's number of employees. Firms in SIC codes 2611, 2621, and 2631 are defined as small if they have fewer than 750 employees.

The size categories reported in the Statistics of U.S. Businesses (SUSB) do not coincide with the SBA small firm standard of 750 employees. It is therefore not possible to apply the SBA size thresholds precisely. The SUSB data presented in Table 4A-6 below show the following size distribution in 1996:

- 27 of 43 firms in the *Pulp Mills* sector had less than 500 employees. Therefore, at least 63 percent of firms were classified as small. These small firms owned 31 facilities, or 50 percent of all facilities in the sector.
- 126 of 186 (68 percent) firms in the *Paper Mills* sector had less than 500 employees. These small firms owned 134, or 39 percent of all paper mills.
- 53 of 101 firms in the *Paperboard Mills* sector had less than 500 employees. Therefore, at least 52 percent of paperboard mills were classified as small. These firms owned 54, or 24 percent of all paperboard mills

Table 4A-6 below shows the distribution of firms, facilities, and receipts for each profiled sector by employment size of the parent firm.

Table 4A-6: Number of Firms, Facilities, and Estimated Receipts by Firm Size Category for Profiled Paper and Allied Products Sectors, 1996

Employment Size Category	Pulp Mills (SIC 2611)			Paper Mills (SIC 2621)			Paperboard Mills SIC 2631		
	No. of Firms	No. of Facilities	Estimated Receipts ($1999 millions)	No. of Firms	No. of Facilities	Estimated Receipts ($1999 millions)	No. of Firms	No. of Facilities	Estimated Receipts ($1999 millions)
0-19	14	14	23	50	50	36	20	20	29
20-99	8	8	99	32	33	388	12	12	143
100-499	5	9	95	44	51	2,704	21	22	556
500-2499	6	9	1,011	28	52	3,221	15	25	1439
2500+	10	22	4,034	32	158	26,311	33	149	17405
Total	43	62	5,262	186	344	32,660	101	228	19572

Source: Small Business Administration, Statistics of U.S. Businesses.

d. Concentration and Specialization Ratios

Concentration is the degree to which industry output is concentrated in a few large firms. Concentration is closely related to entry and exit barriers with more concentrated industries generally having higher barriers.

The four-firm ***concentration ratio*** (CR4) and the ***Herfindahl-Hirschman Index*** (HHI) are common measures of industry concentration. The CR4 indicates the market share of the four largest firms. For example, a CR4 of 72 percent means that the four largest firms in the industry account for 72 percent of the industry's total value of shipments. The higher the concentration ratio, the less competition there is in the industry, other things being equal.[4] An industry with a CR4 of more than 50 percent is generally considered concentrated. The HHI indicates concentration based on the largest 50 firms in the industry. It is equal to the sum of the squares of the market shares for the largest 50 firms in the industry. For example, if an industry consists of only three firms with market shares of 60, 30, and 10 percent, respectively, the HHI of this industry would be equal to 4,600 ($60^2 + 30^2 + 10^2$). The higher the index, the fewer the number of firms supplying the industry and the more concentrated the industry. An industry is considered concentrated if the HHI exceeds 1,000.

The concentration ratios for the three profiled industry sectors remained relatively stable between 1987 and 1992. None of the profiled industries are considered concentrated based on the CR4 or the HHI. The Pulp Mills sector has the highest concentration of the three sectors with a CR4 of 48 percent and a HHI of 858 in 1992.

The ***specialization ratio*** is the percentage of the industry's production accounted for by primary product shipments. The ***coverage ratio*** is the percentage of the industry's product shipments coming from facilities from the same primary industry. The coverage ratio provides an indication of how much of the production/product of interest is captured by the facilities classified in an SIC code.

The specialization ratios presented in Table 4A-7 indicate a relatively high degree of specialization for each profiled Paper and Allied Products industry sector.

[4] Note that the measured concentration ratio and the HHF are very sensitive to how the industry is defined. An industry with a high concentration in domestic production may nonetheless be subject to significant competitive pressures if it competes with foreign producers or if it competes with products produced by other industries (e.g., plastics vs. aluminum in beverage containers). Concentration ratios are therefore only one indicator of the extent of competition in an industry.

Table 4A-7: Selected Ratios for Profiled Paper and Allied Products Sectors

SIC Code	Year	Total Number of Firms	Concentration Ratios					Specialization Ratio	Coverage Ratio
			4 Firm (CR4)	8 Firm (CR8)	20 Firm (CR20)	50 Firm (CR50)	Herfindahl-Hirschman Index		
2611	1987	26	44%	69%	99%	100%	743	87%	69%
	1992	29	48%	75%	98%	100%	858	81%	72%
2621	1987	122	33%	50%	78%	94%	432	91%	96%
	1992	127	29%	49%	77%	94%	392	90%	95%
2631	1987	91	32%	51%	77%	97%	431	91%	90%
	1992	89	31%	52%	80%	97%	438	92%	89%

Source: Department of Commerce, Bureau of the Census, Census of Manufactures, 1992.

e. Foreign Trade

The U.S. Paper and Allied Products industry is the most competitive and highest-volume supplier of paper products in the world because of its modern manufacturing base, effective distribution network and skilled labor force. In recent years, the importance of international trade has grown in the Paper and Allied Products industry particularly because of stagnant domestic sales (McGraw Hill, 1998).

The Paper and Allied Products industry has been in a period of globalization for more than a decade. Many U.S. Paper and Allied Products companies are active exporters, but they also engage in foreign production, converting, and packaging operations, and have joint ventures and direct foreign capital investments in partnerships and ownerships (Stanley, 2000).

Exports play an increasingly important role in the Paper and Allied Products industry. Sixty-five percent of the industry's shipment growth between 1989 and 1998 was derived from export sales. The expansion of international paper markets, however, may also have negative effects. Some of the domestic industry's key trade partners – long a target for any excess U.S. paper production – have started to undertake significant investments in their own world-class production facilities (S&P, 2000).

Exports represented approximately 60 percent of the value of shipments for the Pulp Mills sector in 1996 (see Table 4A-8). Despite improved demand in portions of Europe and Latin America, the Asian financial crisis, which began in 1997, still affects the global pulp industry (Stanley, 2000).

This profile uses two measures of foreign competitiveness: ***export dependence*** and ***import penetration***. Export dependence is the share of value of shipments that is exported. Import penetration is the share of domestic consumption met by imports. Export dependence and import penetration for all of the profiled sectors have remained at relatively constant levels between 1989 and 1996. Imports and exports play a much larger role in the Pulp Mills sector than for the other two sectors. Import penetration and export dependence levels for the Pulp Mills sector were 55 and 61 percent, respectively, in 1996. For the Paper and Paperboard sectors, they were 15 and 11 percent, respectively (see Table 4A-8). Another noticeable difference between the three sectors is the presence of a trade surplus in the Pulp Mills sector and a trade deficit in the Paper Mills and Paperboard Mills sectors.

Table 4A-8 presents trade statistics for each of the profiled Paper and Allied Products industry sectors.

Table 4A-8: Trade Statistics for Profiled Paper and Allied Products Sectors						
Year	Value of imports ($1999 millions)	Value of exports ($1999 millions)	Value of Shipments ($1999 millions)	Implied Domestic Consumption†	Import Penetration††	Export Dependence†††
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Pulp Mills (SIC 2611)						
1989	2,321	2,771	4,881	4,430	52%	57%
1990	2,274	2,623	4,977	4,629	49%	53%
1991	2,158	2,942	5,369	4,585	47%	55%
1992	2,179	3,351	5,659	4,487	49%	59%
1993	2,166	2,878	4,966	4,254	51%	58%
1994	2,407	3,111	5,084	4,379	55%	61%
1995	2,519	3,160	4,658	4,017	63%	68%
1996	2,355	3,041	4,988	4,302	55%	61%
Average Annual Growth Rate	*0%*	*1%*	*0%*	*0%*	*1%*	*1%*
Paper and Paperboard Mills (SIC 2621, 2631)						
1989	7,935	3,249	54,909	59,595	13%	6%
1990	8,095	3,778	55,033	59,350	14%	7%
1991	7,817	4,578	53,378	56,616	14%	9%
1992	7,674	4,857	55,081	57,898	13%	9%
1993	8,364	4,851	54,944	58,457	14%	9%
1994	8,039	5,249	58,137	60,927	13%	9%
1995	8,530	5,365	58,407	61,573	14%	9%
1996	8,719	6,038	56,253	58,934	15%	11%
Average Annual Growth Rate	*1%*	*9%*	*0%*	*0%*	*2%*	*9%*

† Implied domestic consumption based on value of shipments, imports, and exports [column d + column b - column c].
†† Import penetration based on implied domestic consumption and imports [column b / column e].
††† Export dependence based on value of shipments and exports [column c / column d].

Source: Department of Commerce, International Trade Administration, Outlook Trends Tables.

4A.3 Financial Condition and Performance

The U.S. Paper and Allied Products industry has a world-wide reputation as a high quality, high volume, and low-cost producer. The industry benefits from many key operating advantages, including a large domestic market; the world's highest per capita consumption; a modern manufacturing infrastructure; adequate raw material, water, and energy resources; a highly skilled labor force; and an efficient transportation and distribution network (Stanley, 2000). Despite these advantages, however, the industry has faced challenges in the past. Domestic sales have stagnated over the past five years, leading the industry to refocus on export sales and direct more resources toward the world market. Leading world producers can no longer focus on the domestic market to achieve sales growth – they must expand their customer base to the world market as globalization in the industry continues into the new millennium (Stanley, 2000).

Financial performance in the Paper and Allied Products industry is closely linked to macroeconomic cycles, both in the domestic market and those of key foreign trade partners, and the resulting levels of demand. Many pulp producers, for example, have not been very profitable during most of the 1990s as chronic oversupply, cyclical demand, rapidly fluctuating operating rates, sharp inventory swings, and uneven world demand has plagued the global pulp market for more than a decade (Stanley, 2000).

Table 4A-9 presents trends in operating margins for the Pulp Mills, Paper Mills, and Paperboard Mills sectors between 1987 and 1996. The table shows fluctuating margins in all three sectors but especially in the Pulp Mills sector. These fluctuation are a reflection of changes in product prices which have resulted from oversupply in the industry.

Table 4A-9: Operating Margins for Profiled Paper and Allied Products Sectors (Millions $1999)				
Year	**Value of Shipments**	**Cost of Materials**	**Payroll (all employees)**	**Operating Margin**
Pulp Mills (SIC 2611)				
1987	4,524	2,118	561	41%
1988	4,555	1,870	484	48%
1989	4,881	1,938	458	51%
1990	4,977	2,302	533	43%
1991	5,369	2,911	702	33%
1992	5,659	3,063	714	33%
1993	4,966	2,885	727	27%
1994	5,084	2,824	642	32%
1995	4,658	2,140	424	45%
1996	4,988	2,969	635	28%
Paper Mills (SIC 2621)				
1987	35,177	18,077	5,604	33%
1988	36,785	18,402	5,234	36%
1989	36,728	19,181	5,114	34%
1990	36,824	19,663	5,277	32%
1991	35,558	19,177	5,570	30%
1992	36,179	19,831	5,981	29%
1993	35,424	19,550	5,920	28%
1994	37,888	21,246	5,929	28%
1995	38,249	19,850	4,703	36%
1996	36,316	18,904	5,139	34%
Paperboard Mills (SIC 2631)				
1987	18,168	9,051	2,460	37%
1988	18,981	8,657	2,317	42%
1989	18,181	8,426	2,182	42%
1990	18,209	8,927	2,343	38%
1991	17,819	9,236	2,406	35%
1992	18,902	9,385	2,502	37%
1993	19,519	10,453	2,710	33%
1994	20,249	10,652	2,648	34%
1995	20,159	9,888	2,106	40%

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

4A.4 Facilities Operating CWISs

In 1982, the Paper and Allied Products industry withdrew 534 billion gallons of cooling water, accounting for approximately 0.7 percent of total industrial cooling water intake in the United States. The industry ranked 5th in industrial cooling water use, behind the electric power generation industry, and the chemical, primary metals, and petroleum industries (1982 Census of Manufactures).

This section presents information from EPA's *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures* on existing facilities with the following characteristics:

- they withdraw from a water of the United States;
- they hold an NPDES permit;
- they have an intake flow of more than two MGD;
- they use at least 25 percent of that flow for cooling purposes.

These facilities are not "new facilities" as defined by the proposed §316(b) New Facility Rule and are therefore not subject to this regulation. However, they meet the criteria of the proposed rule except that they are already in operation. These existing facilities therefore provide a good indication of what new facilities in these sectors may look like. The remainder of this section refers to existing facilities with the above characteristics as "§316(b) facilities."

a. Cooling Water Uses and Systems

Information collected in the Screener Questionnaire found that an estimated 43 out of 66 pulp mills (65 percent), 128 out of 286 paper mills (45 percent), and 45 out of 187 paperboard mills (24 percent) meet the characteristics of a §316(b) facility. Most §316(b) facilities in the profiled Paper and Allied Products sectors use cooling water for contact and non-contact production line or process cooling, electricity generation, and air conditioning:

- Ninety-four percent of §316(b) *pulp mills* use cooling water for production line (or process) contact or noncontact cooling. The two other major uses of cooling water by pulp mills are electricity generation and air conditioning, with approximately 73 and 64 percent of facilities, respectively.

- Eighty-six percent of §316(b) *paper mills* use cooling water for production line (or process) contact or noncontact cooling. Seventy-four percent also use cooling water for electricity generation and 71 percent for air conditioning.

- Almost all, 98 percent, §316(b) *paperboard mills* use cooling water for production line (or process) contact or noncontact cooling. The two other major uses of cooling water by pulp mills are electricity generation with approximately 79 percent and air conditioning with approximately 80 percent of facilities.

Table 4A-10 shows the distribution of existing §316(b) facilities in the profiled Paper and Allied Products sectors by type of water body and cooling system. The table shows that most of the existing §316(b) facilities have either a once through system (109, or 50 percent) or employ a combination of a once through and closed system (61, or 28 percent). The majority of existing facilities draw water from a freshwater water stream or river (140, or 65 percent). Only one facility (0.5 percent) in the industry withdraws from an ocean, and 11 (5 percent) withdraw from an estuary or tidal river. Most of the CWISs located on an ocean or estuary/tidal river use a once-through cooling system.

Table 4A-10: Number of §316(b) Facilities by Water Body Type and Cooling System for Profiled Paper and Allied Products Sectors

Water Body Type	Closed Cycle		Combination		Once Through		Unknown		Grand Total
	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total	
Pulp Mills (SIC 2611)									
Estuary or Tidal River	1	20%	2	40%	2	40%	0	0%	5
Freshwater Stream or River	7	33%	4	19%	10	48%	0	0%	21
Lake or Reservoir	0	0%	2	22%	4	44%	3	33%	9
Lake or Reservoir/ Freshwater Stream or River	0	0%	8	100%	0	0%	0	0%	8
Total†	***8***	***18%***	***16***	***39%***	***16***	***37%***	***3***	***6%***	***43***
Paper Mills (SIC 2621)									
Estuary or Tidal River	0	0%	1	50%	1	50%	0	0%	2
Freshwater Stream or River	10	12%	21	24%	51	59%	4	5%	86
Lake or Reservoir	5	15%	6	18%	22	65%	1	3%	34
Lake or Reservoir/ Freshwater Stream or River	0	0%	1	20%	4	80%	0	0%	5
Ocean	0	0%	0	0%	1	100%	0	0%	1
Total†	***15***	***12%***	***29***	***23%***	***79***	***62%***	***5***	***4%***	***128***
Paperboard Mills (SIC 2631)									
Estuary or Tidal River	0	0	1	0.25	3	0.75	0	0%	4
Freshwater Stream or River	13	0.393939	9	0.27273	11	0.33333	0	0%	34
Lake or Reservoir	2	0.5	2	0.5	0	0	0	0%	4
Lake or Reservoir/ Freshwater Stream or River	0	0	3	1	0	0	0	0%	3
Total†	***15***	***34%***	***16***	***35%***	***14***	***31%***	***0***	***0%***	***45***
Total Paper and Allied Products Industry (SIC 26)									
Estuary or Tidal River	1	9%	4	36%	6	55%	0	0%	11
Freshwater Stream or River	30	21%	34	24%	72	51%	4	3%	140
Lake or Reservoir	7	15%	10	21%	26	55%	4	9%	47
Lake or Reservoir/ Freshwater Stream or River	0	0%	12	75%	4	25%	0	0%	16
Ocean	0	0%	0	0%	1	100%	0	0%	1
Total†	**38**	**18%**	**61**	**28%**	**109**	**51%**	**8**	**4%**	**216**

† Individual numbers may not add up to total due to independent rounding.

Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999.

b. Facility Size

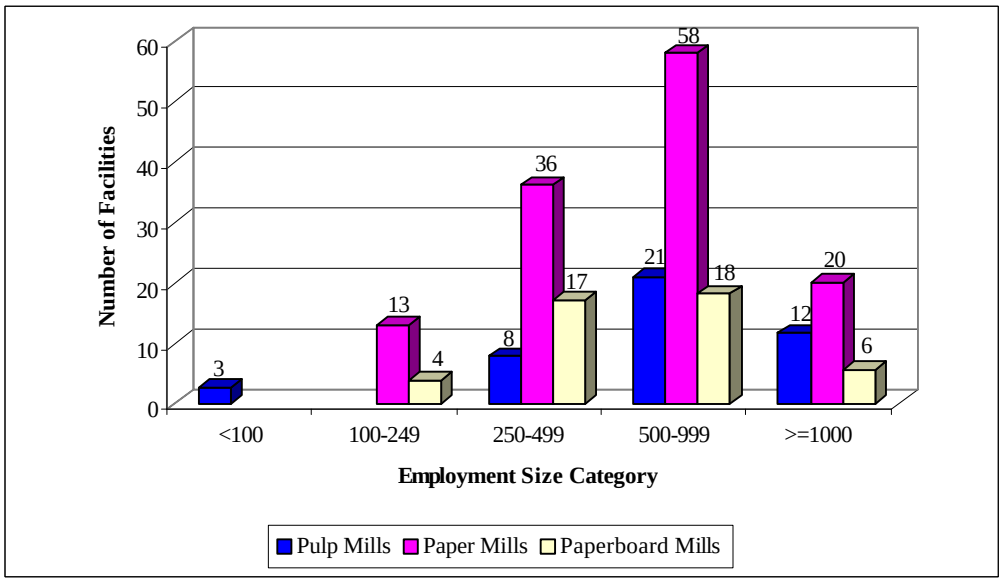
Paper and Allied Product facilities that withdraw more than two MGD from a water of the U.S., hold an NPDES permit, and use at least 25 percent of intake water for cooling purposes are generally larger than facilities that do not meet these criteria:

- Twenty-three percent of all facilities in the overall *Paper Mills* sector have fewer than 100 employees; zero §316(b) facilities in that sector fall into that employment category.
- Twenty-nine percent of all facilities in the *Pulp Mills* sector have fewer than 100 employees compared to 7 percent of the §316(b) facilities.
- Thirty-nine percent of all facilities in the *Paperboard Mills* sector have fewer than 100 employees compared to zero of the §316(b) facilities.

The majority of §316(b) paper mills, 78 or 61 percent, employ 500-999 employees. The §316(b) paperboard mills are more evenly distributed across employment categories with 17 facilities (38 percent) employing 250-499 employees, and 18 facilities (40 percent) employing 500-999 employees.

Figure 4A-7 shows the number of §316(b) facilities in the profiled chemical sectors by employment size category.

Figure 4A-7: Number of §316(b) Facilities by Employment Size for Profiled Paper and Allied Products Sectors



Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999.

c. Firm Size

EPA used the Small Business Administration (SBA) small entity size standards to determine the number of existing §316(b) facilities in the three profiled Paper and Allied Products sectors that are owned by small firms. Firms in this industry are considered small if they employ fewer than 750 people.

Table 4A-11 shows that §316(b) facilities in this industry are predominantly owned by large firms. Only nine of 216 facilities, or less than five percent, are owned by a small firm. An additional five facilities are owned by firms of unknown size. These may also qualify as small firms. The distribution of facilities by firm size is similar within the three profiled sectors: Six and five percent of pulp and paper mills, respectively, are owned by a small firm. None of the 45 §316(b) facilities in the Paperboard Mills sector are owned by a small firm.

Table 4A-11: Number of §316(b) Facilities in Profiled Paper and Allied Products Sectors by Firm Size

SIC Code	SIC Description	Large		Small		Unknown		Total
		Number	% of SIC	Number	% of SIC	Number	% of SIC	
2611	Pulp Mills	38	89%	3	6%	2	5%	43
2621	Paper Mills	118	93%	6	5%	3	3%	128
2631	Paperboard Mills	45	100%	0	0%	0	0%	45
Total		201	93%	9	4%	5	2%	216

Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999; D&B Database, 1999.

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